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Deposition of zinc oxide thin film on wire by DCMS / HiPIMS techniquesAntoine Lejars¹, David Duday¹, David Horwat², Patrick Choquet¹, Philippe Pigeat², Tom Wirtz¹¹Centre de Recherche Public - Gabriel Lippmann, Belvaux, Luxembourg ²Institut Jean Lamour, Nancy, France

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ZnO shows a relatively high piezoelectric coupling, and it is easier to control the film stoichiometry, texture and other properties compared with other piezoelectric thin films [1, 2]. Zinc oxide is also biosafe and therefore suitable for biomedical [3] or textile applications, opening a wide range of novel applications. A lot of methods have already been used to deposit ZnO thin films [2] and r.f. magnetron sputtering was shown to be one of the most appropriate to elaborate piezoelectric thin films [2]. However, in order to in-line deposit ZnO piezoelectric films on wires, the sputtering process has to be further improved in order to obtain a good enough film adhesion, microstructure and homogeneity whatever the substrate nature (metal, polymer). The use of the HIPIMS technique can be used to deposit higher quality and adherent ZnO piezoelectric films on different kinds of wires.

In this paper, the deposition of piezoelectric ZnO films on metal and polymer wires is investigated. Two different techniques are compared: DC magnetron sputtering (DCMS) and high power impulse magnetron sputtering (HIPIMS). We discuss the influence of the nature of the substrate (polymer, metal, need of a buffer layer) as well as of the different deposition parameters (power, pressure, oxygen ratio, bias, duty cycle) on film homogeneity, structure (ZnO c-axis oriented) and adhesion.

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Keywords

ZnO

HIPIMS

wire

microstructure

adhesion